Forest Health Protection

Pacific Southwest Region

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To: Forest Supervisor, Cleveland National Forest
Subject: Forest Health Conditions for 2008 and update on goldspotted oak borer activities (FHP Report # SC-09-02)

Aerial surveys were conducted on the Cleveland National Forest (CNF) during the week of July 21st, 2008. Two days were devoted to surveying insect and disease mortality across the three districts. Forest Health Protection (FHP) assisted Forest Health Monitoring (FHM) with detection and mapping efforts (Appendix 1); higher clarity maps of aerial data can be found at http://www.fs.fed.us/r5/spf/fhp/fhm/aerial/draft/index.shtml using Goggle Earth. Ground surveys were conducted throughout the year to verify mortality mapped and to scout additional problems not detected during flights. The following report represents significant insect and disease problems surveyed in 2008 and relevant forest health issues that are occurring elsewhere in southern California.

Goldspotted oak borer

Mortality of coast live oak, *Quercus agrifolia*, California black oak, *Q. kelloggii*, and canyon live oak, *Q. chrysolepis*, continued throughout the Descanso RD. Aerial surveys detected an estimated 1,537 dead oaks on and surrounding the Descanson RD in 2008 (Fig. 1). Oak mortality is attributed to the recently discovered goldspotted oak borer (GSOB), *Agrilus coxalis*. GSOB-caused mortality was confirmed throughout most of the Descanso Ranger District. The northern corner of the district is currently not experiencing oak mortality from GSOB. Engelmann oak, *Q. engelmannii*, has not been found with GSOB-caused injury. This oak species is believed to not be susceptible to GSOB injury. We hypothesize that bark thickness and structure may be involved in the decreased susceptibility of Engelmann oak to GSOB.

Figure 1. Coast live oak killed by goldspotted oak borer injury.

In 2008, purple and lime green flight-intercept prism traps placed around the Pine Valley community were effective for monitoring GSOB populations. Monitoring for GSOB populations will occur on all three ranger districts in 2009, using both trap types. Trapping will monitor for GSOB populations extensively between the Descanso and Palomar RD's, across the three other National Forests in southern California, and surrounding private, county, and state land. Determining GSOB's range in southern California is a high priority this year for FHP. The range of GSOB is currently still believed to be confined to the Descanso RD and vicinity. Early detection of GSOB populations may assist to limit oak mortality in additional areas.

Purple prism traps determined that GSOB adults were active from mid-June to early November. Flight period is expected to begin earlier in the year, but was missed due to timing of the initial discovery of this beetle. Monitoring of GSOB's flight period will continue in 2009 and determine the best time for future survey work. Trapping studies planned in 2009 will also test various lures and trap heights that may enhance survey effectiveness. Data that will be collected on adult emergence and landing rates on living trees will fill in gaps in GSOB's life history.

Kim Camilli, California Department of Forestry and Fire (Cal Fire), has conducted some initial root and soil sampling of GSOB-infested trees. These samples were prepped by Cal Fire and sent to the University of California, Berkley for pathogen identification. Though *Phythopthora* spp. were detected on the roots of one California black oak and in the soil near coast live oaks, samples were contaminated and the species could not be identified. Additional sampling is required to determine the distribution of the pathogen in the area and if it is playing a role in the continuing oak mortality.

Additional work is focusing on the emergence of GSOB from firewood and control of spread. GSOB larvae have been collected from firewood, and studies in 2009 will determine the probability of adult emergence from firewood and possible management strategies. This work will also provide the foundation for firewood restrictions that will potentially help limit the spread of GSOB. FHP is working collaboratively with personnel from the CNF, Pacific Southwest Research Station (PSW), FHM, Cal Fire, University of California, Davis, Statewide IPM, and USDA Natural Resource Conservation System. These agencies and others (Riverside Conservation Authority, Forest Area Safety Task Force, County of Agricultural Offices in San Diego, and University of California, Extension) are assisting with additional trapping, outreach and educational efforts, and supporting private landowners. FHP and PSW have presented >20 lay and scientific talks or posters to educate and spread awareness about this new issue. A Pest Alert, scientific manuscript, conference proceedings, and several outreach materials have been produced by FHP and PSW to inform about GSOB. Additional information about GSOB can be found on the FHP (http://www.fs.fed.us/r5/spf/fhp/socal/index.shtml) and the CNF (http://www.fs.fed.us/r5/cleveland/projects/projects/oak-borer/index.shtml) websites.

In 2009, the following studies will focus on assessing GSOB biology, impact, and management on the CNF:

- Determining the life cycle of GSOB: adult emergence and flight period (FHP and PSW)
- The current distribution of GSOB in southern California (FHP and PSW)
- Forest stand assessment for infestation levels and current tree mortality (FHP and PSW)
- Efficacy of insecticide treatments for preventing tree mortality from GSOB (FHP and Southern Research Station)
- Adult emergence from firewood and solarization treatments for infested firewood (FHP, PSW, and UC Davis)
- Tree health and susceptibility of oaks to GSOB injury (FHP and PSW)
- Efficacy of lime green and purple panel traps and various trapping heights and lures for surveying GSOB populations (FHP, PSW, and NRCS)
- Comparison of introduced GSOB populations in California to native populations in Arizona (FHP, PSW, and R3-FHP)
- Assessing oak volatiles, oak bark reflectance, and color attractant for adult trapping (FHP, PSW, and APHIS)

- Pathological interaction: sampling roots, adult beetles, and larval galleries for associated fungi (FHP and Cal Fire)
- Oak management and restoration (FHP and UCR)

Pine bark beetles and woodborers

Aerial surveys also detected pine engraver bark beetle, *Ips* spp., -caused mortality in Jeffrey pine, *Pinus jeffreyi*, on Mt. Laguna (Fig. 2). Aerial surveys estimated that pine engraver activity encompassed a total of 30 acres and killed 25 trees within the Wooded Hills area. Pine engraver populations can build-up in stressed trees then aggressively kill healthier pines, but commonly injure stressed trees. Top-kill is common from these bark beetle species. These populations can reach outbreak numbers, but commonly subside in a few years causing limited mortality. Reducing forest stand densities can prevent mortality from this species of bark beetles. Additional mortality of Jeffrey pine by pine engravers is occurring in several pockets along Pine Creek Rd. However, these trees have been previously injured by fire.

Figure 2. Jeffrey pine killed by pine engraver beetles.

Scattered mortality from the California flatheaded borer, *Melanophila californica*, of Jeffrey pine was also found throughout Mt. Laguna. These woodborers commonly kill pines stressed from additional factors (high stand densities, drought, tree damage, etc.), or after beetle populations have sufficiently stressed trees from previous feeding. Mortality is usually limited from this beetle species. Limited insect-caused mortality occurred on the Trabuco and Palomar RD's.

Annosus Root Disease

Ground examination of areas of mortality on the Descanso RD near the Redtail Roost Volunteer Activity Center indicated infection centers of annosus root disease caused by the fungus *Heterobasidion annosum*. Many broken stumps and roots of Jeffrey pine had stringy white rot typical of advanced annosus root decay, and all age classes were affected. Blowovers at the stump are a common indicator of root disease, and blowovers at the stump were more common than blowdowns with stem breakage. Disease-caused snags leaning against other trees or onto non-functioning power lines sometimes occurred near walking paths and may be hazardous.

Jeffrey pine were likely dying from the combined effects of several agents detected on the site: annosus root disease, dwarf mistletoe, *Arceuthobium campylopodum*, California flatheaded borers, and attacks by *Ips* spp. pine engraver bark beetles. Despite the presence of multiple agents, annosus should be considered the primary cause of mortality when mortality occurs at the margins of an annosus root disease infection center. The persistence of annosus root disease and its capacity to generate hazard trees reinforce the need to ensure that cut stumps are treated with Sporax to prevent establishment of what can become a "legacy" problem.

Potential and emerging insect and disease problems

Redhaired pine bark beetle detected

Additional surveys conducted by Forest Health Protection and PSW will continue for the redhaired pine bark beetle, *Hylurgus ligniperda*, on the Cleveland, Angeles, and San Bernardino NF's in 2009. The redhaired pine bark beetle is exotic to the U.S., but native to southern and central Europe. The redhaired pine bark beetle was first detected in the Los Angeles Basin in 2003. Trapping for this exotic species was conducted on the CNF in 2008, but the beetle was not collected. It has not been associated with tree mortality. Redhaired pine bark beetle is a forest health concern because it may be a vector for black stain root disease.

New alder canker disease in LA basin.

In 2008, a new disease of alders was found in the Los Angeles basin by UC Riverside Extension pathologist Deb Mathews in diseased Italian alders at a number of landscape plantings. The pathogen, *Phytophthora siskiyouensis*, causes bleeding trunk cankers on the alder host and had only been identified once before in California. One site on the Angeles National Forest where alders are showing similar symptoms is under investigation. Distribution is currently unknown. SoCal Forest Health Protection would welcome information to locate sites where alders are declining or dying on the CNF to determine whether the disease has been established on the forest.

Conclusions

FHP continues to focus on forest health impacts caused by GSOB. Collaborations with several agencies are spreading awareness about this new pest and increasing our understanding of its biology. Studies initiated in 2008 and 2009 will further assist methods for surveying and managing this new pest to southern California. The support of the forest and assistance from forest personnel have been very crucial in the current progress made with this new pest.

If there are additional areas of mortality that require monitoring or assessment, please contact Forest Health Protection personnel.

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Appendix 1. Tree mortality that was aerially mapped on the Cleveland National Forest in 2008.